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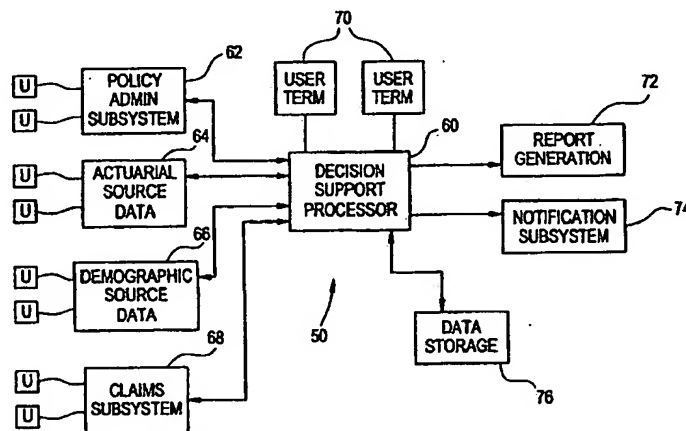
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(54) Title: DECISION SUPPORT SYSTEM AND METHODOLOGY WITH MULTI-DIMENSIONAL ANALYSIS



(57) Abstract: A system and method is provided to query and analyze data in order to assist in decision with respect to the underwriting, marketing and packaging of financial products. In one particular embodiment, the system and methodologies disclosed herein allow the determination of the actual results and the expected results for long term care insurance based upon data provided to the system. Such data may include, for example, policy administration data, actuarial data, demographic data and claims data. Actual results for the insurance policies, such as the amount of premiums that have been paid by the policy holder and the amount of claims paid out as a result of the policy (as well as expected costs associated with the ongoing satisfaction of existing claims), may be aggregated as specified, calculated and displayed for the user. Expected results for the insurance policies, such as the expected amount of premiums to be paid by the policy holder and the expected amount of claims to be paid out on the policy, may also be aggregated, calculated and displayed. The actual and expected results can be compared, including the calculation of the ratio of actual to expected results.

## DECISION SUPPORT SYSTEM AND METHODOLOGY WITH MULTI-DIMENSIONAL ANALYSIS

### Field of the Invention

The present invention is related generally to decision support systems and more specifically to decision support systems for financial products that permit analysis and decision support in multiple dimensions.

5

### Background of the Invention

Risk assessment and analysis systems are used in a variety of business and other private and public contexts. Generally, such systems are used to analyze and support decisions with respect to various data, relationships and proposed actions based on  
10 known correlations between identified variables and related risk factors. Such correlations are often useful in assessing the risk associated with a proposed action or set of actions so that a determination can be made whether to take the action(s) and/or how to allocate the risk associated with such action(s).

The risks associated with insurance policies, such as long term care insurance  
15 policies, is an illustrative example. Long term care (LTC) insurance policies typically provide, in return for payment of premiums, a benefit in the event an individual becomes confined in a facility such as a nursing home as a result of aging, sickness or some form of accident. The "risks" associated with these policies, as well as most other insurance policies, from the point of view of the insurer is the potential for the  
20 payment of claims made by an insured under a policy. These "risks" may be assessed on an individual basis (i.e. with respect to each policy individually) or in the aggregate, or both.

LTC policies are beneficial to, for example, older individuals to supplement existing insurance, such as Medicare, Medigap, and other traditional health insurance plans because the LTC policies typically pay for nursing home stays, extended home health care, and other related expenses. Long term care insurance is a relatively new product only recently being offered by insurers. Additionally, the claims made under these policies may develop over many years. For example, an insured may initially purchase the insurance in his or her fifties while the first claim may not be made until thirty years later when the individual is in his or her eighties. As a result, LTC insurance policies currently suffer from the drawback that insurers have limited operating experience available to them to assist them in determining actual claim rates and predicted claim costs that may be experienced in the future.

Risk assessment may also be used to determine or aid in the determination of a proposed purchase prices for financial products or businesses holding such financial products as assets. In the example of LTC insurance policies, an insurer may want to buy or sell one or more insurance policies from another insurer or from a third party in connection with the sale of a business or otherwise. In some cases, insurers may want to sell policies to diversify risk. Additionally, one insurer may wish to purchase the business of another insurer. These transactions may be hard to price especially if some or all of the assets consist of LTC insurance policies since these policies, as mentioned above, are typically difficult to accurately price since limited information about expected and actual claims may be available.

In addition LTC insurance policies (as well as other newer financial products) may have further difficulties associated with them in that insurers and potential insurers may lack information and experience in connection with the marketing of LTC insurance policies to customers. Insurers may desire to target marketing and offers of the LTC policies to customers who are interested in purchasing a policy. Further, insurers may desire to market particular products only to customers where the insurer will have the best relative profitability by offering the products. Such marketing may be difficult to perform due to lack of information about LTC insurance policies.

These and other drawbacks exist.

### Summary of the Invention

An object of the present invention is to overcome these and other drawbacks in existing systems and methods.

5 Another object of the invention is to provide a system and method for providing decision support based upon one or more sources of data.

Yet another object of the present invention is to provide insurers and other offerors of financial products with a tool for analyzing the profitability associated with various proposed actions in connection with various financial products.

10 A still further object of the present invention is to provide insurers and other offerors of financial products with a tool for analyzing and optimizing marketing and other business activities in connection with various financial products.

An even further object of the present invention is to provide insurers with a system and methodology for optimizing underwriting rules in connection with insurance products.

15 A yet further object of the present invention is to provide system users with multidimensional analysis capabilities in connection with insurance and other financial products.

20 Another object of the present invention is to provide a system and method that provides accurate information reflective of the value of financial products based upon various input data associated with such financial products.

25 Another object of the invention is to provide a system and method for calculating actual results, expected results, and the ratio between actual and expected results in connection with insurance policies, thereby allowing for robust, flexible, and useful data analysis.

Another object of the invention is to provide a system and method for calculating measures and metrics such as net present value, acquisition costs, mortality rates and lapse rates in connection with insurance policies.

5 These and other objects of the invention are accomplished according to various embodiments of the invention. A system and method is provided to query and analyze data in order to assist in decision making with respect to the underwriting, marketing and packaging of financial products. In one particular embodiment, the system and methodologies disclosed herein further allow the determination of the actual results and the expected results for long term care insurance based upon data  
10 provided to the system. Such data may include, for example, policy administration data, actuarial data, demographic data and claims data. Actual results for the insurance policies, such as the amount of premiums that have been paid by the policy holder and the amount of claims paid out as a result of the policy (as well as expected costs associated with the ongoing satisfaction of existing claims), may be aggregated  
15 as specified, calculated and displayed for the user. Expected results for the insurance policies, such as the expected amount of premiums to be paid by the policy holder and the expected amount of claims to be paid out on the policy, may also be aggregated, calculated and displayed. The actual and expected results can be compared, including the calculation of the ratio of actual to expected results.

20 Results can also be segmented by range or value within dimensions as selected by the user such as age, marital status and profession. From these results, various analysis calculations may be performed, include calculating the net present value of the profit associated with one or more of the policies. Analysis calculations may aid in determining underwriting rules which may include the appropriate premium to paid  
25 on LTC policies, as well as determining the present value of the profit of policies for the purposes of selling or purchasing the policies.

According to another embodiment of the invention, analysis calculations may be used to determine the profitability of one or more insurance policies, such as LTC insurance policies. Analysis calculations may be selected to determine the net present  
30 value of the profit associated with one or more insurance policies (e.g., the difference

between the net present value of premiums and the net present value of claims and expenses associated with the policies) Using these values, a user may determine the appropriate price to be paid for one or more insurance policies, or for all or some of the assets of an owner of such policies.

5 According to another embodiment of the invention, a target marketing system may be provided in order to assist in targeting marketing and offers of the LTC policies to customers who are interested in purchasing a policy. Further, the system of the present invention may assist in marketing particular products only to customers where the insurer is likely to be most profitable by offering the products.

10 Other objects and advantages exist for the present invention.

#### **Brief Description of the Drawings**

Figure 1 is a schematic illustration of the primary components of the system of the present invention according to a preferred embodiment of the present invention.

15 Figure 2 is a flow-chart illustrating the overall high level process according to a preferred embodiment of the present invention.

Figure 3 is an exemplary graphical user interface which may be employed in connection with the present invention for displaying the calculated actual to expected results of claim cost in connection with an insurance policy according to a preferred  
20 embodiment of the present invention.

Figure 4 is an exemplary graphical user interface which may be employed in connection with the present invention for displaying results of a market analysis in connection with an insurance product according to a preferred embodiment of the present invention.

25 Figure 5 is an illustration of exemplary data which may be associated with calculations for assessing a prospective business mix change according to the teachings of the present invention in a preferred embodiment thereof.

### Detailed Description of the Preferred Embodiments

5 The present invention is described in relation to a system and method for querying, analyzing and decision support related to insurance policies for long term care. Nonetheless, the system aspects and methodologies disclosed herein may be also be applied by those of skill in the art to other financial products and offerings as well as other applications involving data analysis particularly with respect to financial products which are serviced over many years.

10 Figure 1 is a schematic representation of the decision support system 50 of the present invention in a preferred embodiment thereof. In addition to the components shown in Figure 1, other components providing additional sources of data and/or additional reporting capabilities may also be present. Decision Support System (DSS) 50 preferably comprises Decision Support Processor (DSP) 60 which is responsible for  
15 centralized control of DSS 50 as well as the processing functions associated with decision support according to the present invention. Various data sources are also preferably included in connection with DSS 50. For example, and as shown in Figure 1, DSS 50 may include policy administration subsystem 62, actuarial source data 64, demographic source data 66 and claims subsystem 68.

20 Each of these data sources contemplate an embodiment wherein a user of DSS 50 is seeking decision support in connection with insurance policies or related financial products. Decision support in other contexts according to the teachings of the present invention may be achieved using additional and/or substituted input sources as well as alternate calculations without departing from the scope and spirit of the present  
25 invention.

DSS 50 may also include one or more user terminals 70 which allow users to interact with DSS 50 through DSP 60. User terminals 70 may be any conventional device, such as a personal computer, terminal, or browser application and may accept user

input via known devices such as a keyboard, touch-screen, roller-ball, mouse, pointer, or other device for a user to enter and view data including making queries and viewing decision support output data. Preferably graphical user interfaces (GUIs) guide a user at user terminal 70 through the process of selecting input data, introducing constraints and queries and initiating and processing decision support capabilities.

Other components included in DSS 50 may also include a report generation process 72 which functions to control some or all of the decision support output so that it may be used by individuals or an organization. Notification subsystem 78 may also be present. Notification subsystem 78 provides automated notices to predetermined individuals in one or more organizations based upon decision support output over time. For example, when DSS 50 illustrates for a user that one or more business practices should be changed as well as the expected benefit of these changes (as will be discussed below), notification subsystem 78 may automatically generate email messages to designated individuals (e.g. underwriters, senior management and marketing personnel) indicative of the changes and the expected benefits thereof. Another possibility is to configure notification subsystem 78 such that senior management or other designated individuals may be notified by email, intranet or internet posting or otherwise on a periodic basis as to what the net present value or profit is for some or all of the available products within an organization. DSS 50 may also include separate data storage 76 where data such as stored queries, output data, source data and other data associated with calculations may be maintained. Data storage 76 may comprise any conventional storage device, such as a computer memory, a magnetic or optical discs or CD-ROMS, tape-to-tape reels, or other devices for storing data.

In the context of LTC insurance policies source input data which may be useful or necessary to provide decision support may include, for example, data available through policy administration subsystem 62. This system may be a separate system operated through a mainframe or in a client/server environment but in communication with DSP 60 via dedicated connection (e.g. LAN, WAN, etc.) or through an intranet or internet connection. Alternatively, data from each of the data sources disclosed



herein may be made available on a periodic basis via download, file transfer or any other means for making the necessary data available to DSS 50. Policy administration subsystem 62 may also include multiple user terminals as shown in Figure 1. Policy administration subsystem 62 may contain insurance policy data associated with many different policies of many different types taken out by many different individuals. For example, in the case of an individual LTC policy taken out by a particular person, a policy record may contain data including the insured's name, address and other contact information, the beneficiary's name, address and other contact information, the date the policy was taken out, the amount and frequency of premium payments necessary to keep the policy in force, the benefits available under the policy including any rules associated with the payment of claims (e.g. deductibles, benefit periods, elimination periods, maximum aggregate claims payable), the premium payment status as well as other information associated with the initiation and maintenance of the policies.

Actuarial source data 64 may be available as a file or set of files or, alternatively, the data may be available through a separate actuarial subsystem. Again, the required data available through this data source may be communicated to DSP 60 in any of a number of ways including via the internet, through a direct connection or via periodic extracts. User terminals may also be present to allow a user to store, manipulate, view and/or transfer actuarial data. Actuarial data which may be present through actuarial source data component 64 in connection with the LTC embodiment of the present invention includes life expectancies, probabilities of and expected costs associated with long term care utilization at various ages and expected costs and durations of long term care claim events. According to an embodiment of the invention, actuarial source data 64 may also comprise tables of expenses, tables of premiums, tables of interest rates, and tables of expected results related to various LTC insurance policies. An expense table may comprise fixed costs, such as the expenses incurred per year to maintain a policy, variable premium costs, such as commissions based on premiums, and variable benefit costs, such as claim expenses. According to an embodiment of the invention, if no suitable expense table is available from a previous query, a user may generate an expense table based on a query. The

expense table may be saved for later retrieval. According to an embodiment of the invention, a previously saved expense table may be updated to account for new products, changes in expenses, or other information. Other manners of manipulating expense tables may also be used.

5 An expected table may contain information related to expected values, such as expected premiums for a given time period, expected claims for a given time period, expected lapses (through death of the policy holder or through failure to pay premiums), and other expected information, from a previous query. According to an embodiment of the invention, if no suitable expected table is available from a  
10 previous query, a user may generate an expected table based on a query. An expected table may be saved for later retrieval. According to an embodiment of the invention, a previously saved expected table may be updated to account for new products, new expenses, changes in premiums or interest rates, or other information. Other manners of manipulating expected tables may also be used.

15 A premium table may contain information related to premium values, such as expected premiums for a given time period, changes in premiums, commissions paid on premiums, and other premium information, from a previous query. According to an embodiment of the invention, if no suitable premium table is available from a previous query, a user may generate a premium table based on a query. A premium  
20 table may be saved for later retrieval. According to an embodiment of the invention, a previously saved premium table may be updated to account for new products, changes in premiums, or other information. Other manners of manipulating premium tables may also be used.

25 A interest rate table may contain information related to interest rate values, such as actual interest rates, changes in interest rates, and other premium information, from a previous query. According to an embodiment of the invention, if no suitable interest rate table is available from a previous query, a user may generate an interest rate table based on a query. An interest rate table may be saved for later retrieval. According to an embodiment of the invention, a previously saved interest rate table may be

updated to account for new products, changes in interest rates or other information. Other manners of manipulating interest rate tables may also be used.

Demographic source data 66 may also be included in connection with the DSS 50 of the present invention. The type of information available through this resource is greatly varied and may include any information which is helpful in providing decision support according to the teachings of the present invention. For example, demographic data may include data indicative of the number of people in various professions, the number of people in various geographical areas, income levels, gender information, health care cost information by geographic area as well as an almost unlimited number of additional sets of data describing people and various characteristics with respect to them. The demographic data available to DSS 50 may also be provided on a segregated basis specific only to policy holders. As will be discussed below, demographic data available through demographic source data 66 supports the decision support capabilities of the present invention particularly with respect to the solicitation decision support features described below.

Particularly with respect to insurance product embodiments of the present invention, DSS 50 may also include a data source such as claims subsystem 68. In this context, claims subsystem may be a separate system operated by an insurer or an insurance product servicing company that maintains various information about claims made in connection with outstanding insurance policies. In the case of LTC insurance policies, claims subsystem 68 may contain data reflective of past claims made under all relevant policies and costs incurred in connection with each of them. As will be seen below, this data is especially important in connection with the underwriting rules and profitability decision support capabilities of the present invention.

Figure 2 is a flowchart illustrating the overall process flow of the present invention. Some of the steps illustrated in this figure are performed by the user and some are performed by the system of the present invention. At the point at which a user decides to use the system of the present invention, the user will log onto DSS 50 and may be requested to provide a user id, a password and/or other identifying information. Users of the system of the present invention in connection with the LTC

insurance embodiment may include, for example, underwriters, actuaries, marketing and sales personnel, senior management and others interested and/or involved in the product(s) offered by the organization.

At step 10 in the process, the user formulates and selects a query to be made against  
5 the universe of data available to DSS 50. The query may be constructed and submitted via user terminal 70 as shown in Figure 1. Queries may be made and formulated by the user "on the fly" or, alternatively, the user may access a set of stored queries and select one or more such stored queries for execution. By way of example, an actuary may desire to query the universe of data to select policy holders  
10 that applied and were accepted for LTC insurance in the State of Kansas. The query may be made via a pull down menu or various other input screens available to the user. In a preferred embodiment of the invention, but by no means the only embodiment, the user interfaces are driven by the Whitelight OLAP application version 1.53 available through Whitelight located in Palo Alto, California.  
15 Compound and more complex queries may also be provided in connection with the present invention. For example, ranges and multiple constraints may be specified by a user.

After the user specifies and submits the query in step 10, the system of the present invention proceeds to step 12 wherein the system gathers the data which results from  
20 the query. In the example, when a user queries for all policies initiated in Kansas, DSP 60 may access policy administration subsystem 62 in order to collect the data necessary to respond to the query. The response from policy administration subsystem 62 may include all policy data for all of the individuals who applied for policies in Kansas. Once these records are retrieved, DSP 60 may also cause  
25 additional data associated with the policy data to be retrieved from other data sources. For example, assuming 30,000 policies are retrieved based upon being applied for in Kansas, DSP 60 may, for each of these policies also query demographic source data 66 in order to obtain demographic information associated with each of the policy holders the 30,000 policies. By way of example, the query may return the marital  
30 status for each of the policy holders and include that data in the aggregated response to the query. Additionally, DSP 60 may cause an interaction with claims subsystem

68 in order to obtain and collect data reflective of claims made under each of the 30,000 policies resulting from the initial query.

Although the database query may be accomplished through any technique or standard known in the art, in a preferred embodiment of the present invention, the Whitelight application generates SQL queries and passes them on to a database management system (DBMS) such as made available by the Oracle Corporation in Redwood City, CA. Further, in a preferred embodiment of the present invention, interim query results may be stored in a data storage area which may be permanent storage such as a disk drive or, alternatively, query results may be stored in temporary memory such as RAM.

At step 14 in the process of the present invention, DSP 60 causes the query results to be segmented into dimensions. For purposes of this discussion, it should be understood that by segmenting data into dimensions, it is meant that data is subcategorized according to one or more independent variables each known as a dimension. This step thus includes the selection of dimensions and the establishment of ranges or values associated with each of these dimensions.

Turning back now to the example given above wherein a user has queried upon all policyholders who have applied for and been accepted for LTC insurance in the State of Kansas, now also assume that the dimensions of segmentation selected are marital status, issue age (the policy holder's age at the time the policy is issued), household income, and benefit duration (the amount of time for which a long term care claim will be paid). Each of these dimensions may be segmented as follows:

- Marital Status - by value (e.g. married, single)
- Issue Age - user selected range (e.g. Under 40, 40-45, 46-50, 51-55 etc.)
- Household Income - user selected range (e.g. under \$30,000, \$30K - 40K, \$40K-50K, \$50K+)
- Benefit Duration - by value based upon the options offered to the policy holder (e.g. 2 years, 4 years, 6 years, lifetime)

In addition to the dimensions listed above, many other dimensions may also be specified by the user. In the system of the present invention, ranges may be pre-stored or they may be generated "on the fly" by a user or some combination of both.

5 Continuing with the present example, assume that the user wishes to segment on each of the above dimensions. The user will specify via a graphical user interface each of the dimensions desired and the segmentation options for each of the dimensions. In most cases, users will seek to view the data broken down for each dimension with respect to all possible values for that dimension or with respect to all possible ranges

10 for that dimension. However, the user may alternatively decide to confine the results of the view to only a subset of possible values or ranges within a particular dimension. In this latter case, for example, the user may simply wish to view married policyholders win connection with the marital status dimension.

Once the segmentation specification has been completed according to step 14, the

15 process of the present invention continues with step 16 wherein selected measures are calculated. Selected measures are calculated as specified by the user. The first aspect of step 16 involves determining the basic additive measures (i.e. measures that can be added together). For example, actual dollars of claims represent an additive measure since the dollar amount of claims paid under each individual policy may be

20 aggregated with the others. In order to do this, DSP 60 examines all policies within the query results and places the claim amounts associated with "like" policies into "buckets". Thus the claims paid measure is determined by aggregating the claim amounts of each of the policies with the same value or range for all specified dimensions. For example, if there are 30 policies each taken out by an individual that

25 is married, is between 40 and 45 years of age and has a household income of between \$40,000 and \$50,000, all of these policies would be placed in the same bucket and the total amount of claims paid under these 30 policies would be summed to represent the claims paid measure with the specified dimension values and ranges. In addition to additive measures that are summed, some additive measures may require calculation

30 instead of simply being present in raw form in the relevant database. For example, actual paid claims (the amount of money already paid on existing claims, as

mentioned above) may be retrieved directly from the database while measures such as expected claims (i.e. expected claims based upon original actuarial assumptions at the time of product pricing) and actual projected claims (i.e. unpaid portions of currently existing claims) may require calculation prior to the additive step.

5 The second aspect of step 16 involves the calculation of derived measures. The actual claims (e.g. actual paid claims + actual projected claims)/expected claims ratio is an example of a derived measure. In this case, DSS 60 performs a calculation with respect to multiple additive measures. The actual claims/expected claims ratio, being one example, is calculated on a "bucket" by "bucket" basis by dividing the aggregated  
10 actual claims by the aggregated expected claims. The actual/expected ratio (A/E ratio) is a valuable measure particularly with respect to insurance products in that it reflects the accuracy of original product pricing assumptions. A/E ratios greater than 1 indicate claims cost being greater than originally forecast while A/E ratios less than 1 indicate claims cost being lower than originally anticipated. For each bucket, an  
15 actual claims/expected claims ratio may be calculated. As would be recognized by one of skill in the art, various possible calculations based upon many types of functions may be specified for calculation. Each of these measures may be predetermined through system configuration or through a prior use of the system or they may be created "on the fly" by the user.

20 Upon completion of the calculation of selected measures step, the process of the present invention continues at step 18 wherein measures may be "smoothed" at the option of the user. It will be understood that step 18 is optional and is not always carried out according to the preferred process of the present invention. In the event that certain buckets do not contain enough data points to be considered statistically  
25 reliable, then the user, at his or her option, may either through the use of pre-specified algorithms and functions or by manually editing the measures data, change the values of selected measures associated with buckets that are believed to be statistically unreliable so that the resulting data trend is more consistent and uniform.

30 As an example, in the case of a selected measure consisting of A/E ratios, and when attempting to analyze this measure by policy duration, there will tend to be fewer

policies in the higher numbered durations making the later durations progressively less statistically reliable. Smoothing counters this effect by progressively placing a higher weight on the expected value as actual value data reliability decreases.

5 Once selected measures have been calculated and optionally smoothed, the process continues at step 20 which involves providing decision support. As a general matter, step 20, provision of decision support, comprises using selected measures (which may have been smoothed) in conjunction with actuarial source data provided from the associated data source 66 in order to generate decision support measures which are beneficial to the user on a number of counts as discussed in greater detail below.

10 In the context of LTC insurance products, a calculation of the net present value (NPV) of the profit associated with the aggregate policies in each bucket can result in valuable information for the user. For example, the NPV of the profit may be important in determining the sale price for a grouping of policies from one party to another. Additionally, the NPV of profit for a particular subset of policies may be  
15 helpful to the actuarial function in pricing policies going forward. Underwriters may also use the NPV data in order to assess which applicants are the best candidates for policies and which factors to emphasize in making underwriting decisions. As yet another example, the marketing and sales function may value NPV information in determining marketing strategies and the most profitable target audience for a  
20 particular product or set of products.

The NPV of profit associated with LTC policies on a bucket by bucket basis may be calculated as part of the decision support process as follows. NPV of profit is defined as the NPV of premium minus the NPV of claims and expenses. In order to determine the NPV of premium, the system uses interest, lapse rate and mortality  
25 assumptions to discount the future anticipated premium flow to the present. Other factors may also be considered as determined by the user and system configuration. So therefore, for each bucket, the aggregate premium flow is accessed and discounted as described above resulting in a calculated NPV of premium with respect to each bucket (i.e. with respect to each policy sharing a specified set of characteristics).



In order to determine the NPV of claims by bucket, the experience projected actual claims are discounted using interest, lapse and mortality assumptions found in the actuarial source data 64. Other assumptions may also be used. The aforementioned experience projected actual claims is calculated by multiplying expected claims by the A/E ratio which ratio may have been smoothed. The NPV of expenses may be calculated by discounting expenses (found in the actuarial source data 64) by interest, lapse and mortality as well as other potential assumptions.

Additional decision support capabilities may come in the form of "business mix" analysis. Once buckets have been determined and an NPV associated with each one, it may be desirable to adjust, or consider the adjustment, of various business practices. Using DSS 50, users may project the effect of these proposed business practice changes with respect to the business mix (i.e. the percentage of policyholders or premium dollars in each bucket). Thus, for example, an underwriter may utilize the capabilities of the present invention to project the effect of altering the underwriting guidelines with respect to direct word recall (DWR) or other medical test results for policy applicants. In other words, the underwriter may segment based upon scores. As a result of that segmentation and the processing capabilities of the system of the present invention, the underwriter may find that experience shows that individuals with DWR scores of a certain value are very high claim risks. As such, the underwriter may propose altering the underwriting guidelines to reject individuals having the specified DWR score. According to the teachings of the present invention, DSS 50 may then calculate the resulting overall profitability if the underwriting guidelines were so changed.

Calculations are based upon NPV by bucket so that a composite NPV may be calculated by weighting each bucket according to the percentage of policies falling into each bucket with the goal of increasing the ultimate composite NPV by altering the business mix. It is possible that by eliminating or reducing the population of certain buckets from the business mix, the composite NPV may rise indicating a likely beneficial business practice change. However, in the case of for example, eliminating or reducing the percentage of policy holders with lower DWR scores the composite NPV may theoretically decrease. This might occur in a case where it is

determined that marketing costs (as specified in actuarial source data 64) are significantly higher with respect to individuals having higher DWR scores. Another example of "business mix" projection capabilities is the use by marketing and sales personnel in making determinations as to which buckets to target based upon factors such as acquisition costs and resulting composite NPVs based upon projected desirable business mixes.

Figure 3 illustrates a graphical user interface 100 for displaying results according to one embodiment of the invention. As will be recognized by one of skill in the art, many different variations of GUIs may be used while still providing the benefits and functionality of the system of the present invention. Graphical user interface 100 may contain tool bar 102, such as a toolbar associated with a Windows™ environment. Toolbar 102 may enable a user to save a file, print a screen, enlarge a font, or other functions which are commonly associated with a Windows based system or similar operating systems and programming environments.

Graphical user interface 100 may also contain calculation options toolbar 104. According to an embodiment of the invention, calculation options toolbar 104 may enable a user to manipulate the information which is displayed on graphical user interface 100. This may include specification of functions, specification and modification of new dimensions and possible associated values and ranges. This may also include selections with respect to system defaults and user preferences. GUI 100 may also include a dimension/value/range selection window 108. This window allows a user to determine what buckets are displayed as a result of selections with respect to dimensions and the desired values associated therewith. Information display 106 may display information resulting from the selections made by a user. By way of example only, a user may select to display information related to various segments of business. As illustrated in the example of Figure 3, a user may select the marital status of a policy holder and the maximum payable days to determine how the A/E ratio is impacted by the two attributes. Specifically, the A/E ratio for each bucket resulting from user selections will be displayed. By way of example, information display 106 shows that for all of the marital statuses combined, the A/E ratio is 0.77 for a 730 day benefits payable time period, while the A/E ratio for a

single policy holder over that same time period is 1.08. In this example, no information is available for divorced policy holders. According to an embodiment of the invention, a user may note this lack of information, and take steps to acquire further information related to divorced policy holders. Other segments of business  
5 may also be selected and reviewed. The "U" in the marital status column represents "unknown" where marital status, based upon the available demographic data is unknown.

Dimension/value/range selection bar (DVRS bar) 108 operates in a preferred embodiment as follows. One or more dimensions may be represented on individual  
10 button bars or like icons within DVRS bar 108. In the Figure 3 example, four dimensions are represented: state of policy application, issue age, maximum benefits payable period (EP) and gender. Others may also be available and other buttons may be accessed by, for example, using a horizontal scroll feature to expose additional buttons representing additional dimensions. Each of the button bars may include a  
15 pull down menu which allows the user to select the value, set of values, range or set of ranges which the user wishes to see displayed. In the Figure 3 example, the user has selected the "ALL" qualifier for each of the four dimensions represented by the button bars. Therefore, the data reflected in the grid of display 106 encompasses data which is aggregated for all states, all issue ages, all occupations and all genders. Data  
20 is only broken down according to marital status and EP. As another example, the user may use the pull down menu associated with the "issue age" button to select the ranges 30-34. As a result, in this case, display window 106 would preferably continue to display EPs along the horizontal axis and marital status along the vertical axis. However, the data represented in the grid would change to reflect only those  
25 policies taken out by individuals who were between 30 and 34 years of age at the time of policy issuance. The data would preferably continue to remain aggregated for all states, all occupations and all genders. It is also possible to select, using the button bars, multiple ranges or values in order to adjust the values displayed in the grid. For example a user may select age ranges 30-34 and 35-39 by using the pull down menu  
30 and perhaps using the control key to make multiple selections. As a result, the grid in

display 106 would then reflect data which is representative of policies taken out by individuals who were between 30 and 39 at the time of policy issuance.

Other possibilities for data display manipulation also exist. For example, "drag and drop" may be used to alter the dimensions displayed in the grid. By way of example, if the all genders dimension were dragged and dropped on the vertical axis, display 106 would be changed as follows. There may be two vertical axes, the first labeled "all genders" and the second labeled "all marital statuses" and a total of 8 rows represented along the horizontal axis consisting of all combinations of genders and marital statuses. Within the grid, the A/E claim cost displayed could be specifically observed for any combination of gender, marital status and elimination period (EP).

By reviewing and analyzing various information, a user may view and assess the measures associated with each of the buckets resulting from the display selections made by the user. A user may analyze information to determine, for example, the total value of the premiums that have been collected for one or more policies, the total value of the premiums that are expected to be collected for one or more policies, the total value of expenses currently paid out on one or more policies, and/or the total value of expenses expected to be paid out on one or more policies. Analysis of this information may allow, for example, a user to determine if sufficient premiums are being collected to offset expenses, including benefit claims associated with an LTC insurance policy. A user may select to increase premiums for existing policy holders, increase premiums for future policy holders, and/or reduce expenses associated with an LTC insurance policy. Expenses, as described above, may be benefits claims, commissions, or processing expenses.

Figure 4 is an illustration of a graphical user interface 300 for displaying the profitability of a LTC insurance product by profession. Graphical user interface 300 may contain tool bar 302, such as a toolbar associated with a Windows™ environment. Toolbar 302 may enable a user to save a file, print a screen, enlarge a font, or other functions which are generally available in such an environment.

Graphical user interface 300 may also contain calculation options toolbar 304. According to an embodiment of the invention, calculation options toolbar 304 may enable a user to manipulate the information which is displayed on graphical user interface 300. As illustrated in the example of Figure 4, a user may select to view a particular product or business segment by occupation and profitability to determine what profits are being made on premiums for a product according to the occupation of the policy holder. In the example of Figure 4, a user may select to view the NPV for male policy holders by profession. A user may observe that the category "Self-Employed / Other" loses money for the insurer (based upon a negative NPV of profit), while the category "Student" has the highest NPV at \$30, and therefore is the most profitable. According to this information, a user may determine that increased marketing efforts should be directed toward customers in the "Student" category, while marketing efforts directed to customers in the "Self-Employed / Other" category should be reduced. According to another embodiment of the invention, a user's observation may lead to further analysis of additional factors related to this information, to further refine determinations and decisions. As with the Figure 3 example, the buttons on DVRS bar 308 may be as described above either to restrict the selection of data or, if dragged and dropped, to expand the display to include other dimensions.

Figure 5 is illustrative of the feature of the present invention which permits a user to assess the effect of business mix changes. As shown in Figure 5 on the left hand table (the current business mix), no policies are currently held by individuals with DWR scores of 1, 2 or 3 while 5% of the outstanding policies are held by individuals with DWR scores of 4 at the time the policy was underwritten. Further, 15% of policies are for DWR scores of 5, 25% are for DWR scores of 6, and so on. Based upon this business mix, the composite NPV is 56.75. This number is calculated by the system of the present invention by creating a weighted average of the NPV for each DWR score. Now, assuming that the user wishes to estimate the benefits of changing the underwriting practices to result in a business mix as shown in the right hand table (proposed), he or she can do so by interacting with the system of the present invention to change the percentages. As shown in Figure 5, if the business mix is changed to

result in more policies associated with individuals with higher DWR scores, the composite NPV rises as against the current composite NPV. This allows the user to assess the expected increase in profitability associated with the proposed change(s).

5 According to one specific embodiment of the present invention, the system functionality described above may implemented as a set of software programs resident on a computer system. The system may operate on a network and may be connected to other systems sharing a common database. Other hardware arrangements may also be provided.

10 Other embodiments, uses and advantages of the present invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. For example, the invention described above may be easily modified to provide similar capabilities for other financial products such as mortgages, loans, long term disability insurance, workman's compensation products, malpractice insurance, and other financial products. The invention may also be used  
15 in connection with other products and services such as internet products and services particularly with respect to the marketing targeting aspects of the present invention. The specification and examples should be considered exemplary only. The intended scope of the invention is only limited by the claims appended hereto.

**What is Claimed is:**

1. A method for providing decision support based upon a universe of data comprising:

5 receiving a query from a user;

in response to said query, selecting a subset of said universe of data;

receiving a dimension selection from said user;

in response to said dimension selection, dimensioning said subset of said universe of data;

10 receiving a desired measures selection from said user;

in response to said desired measures selection, calculating said desired measures and organizing said desired measures into a plurality of buckets; and

providing decision support based upon said desired measures.

15

2. The method according to claim 1, wherein said records comprise insurance policies for long term care.

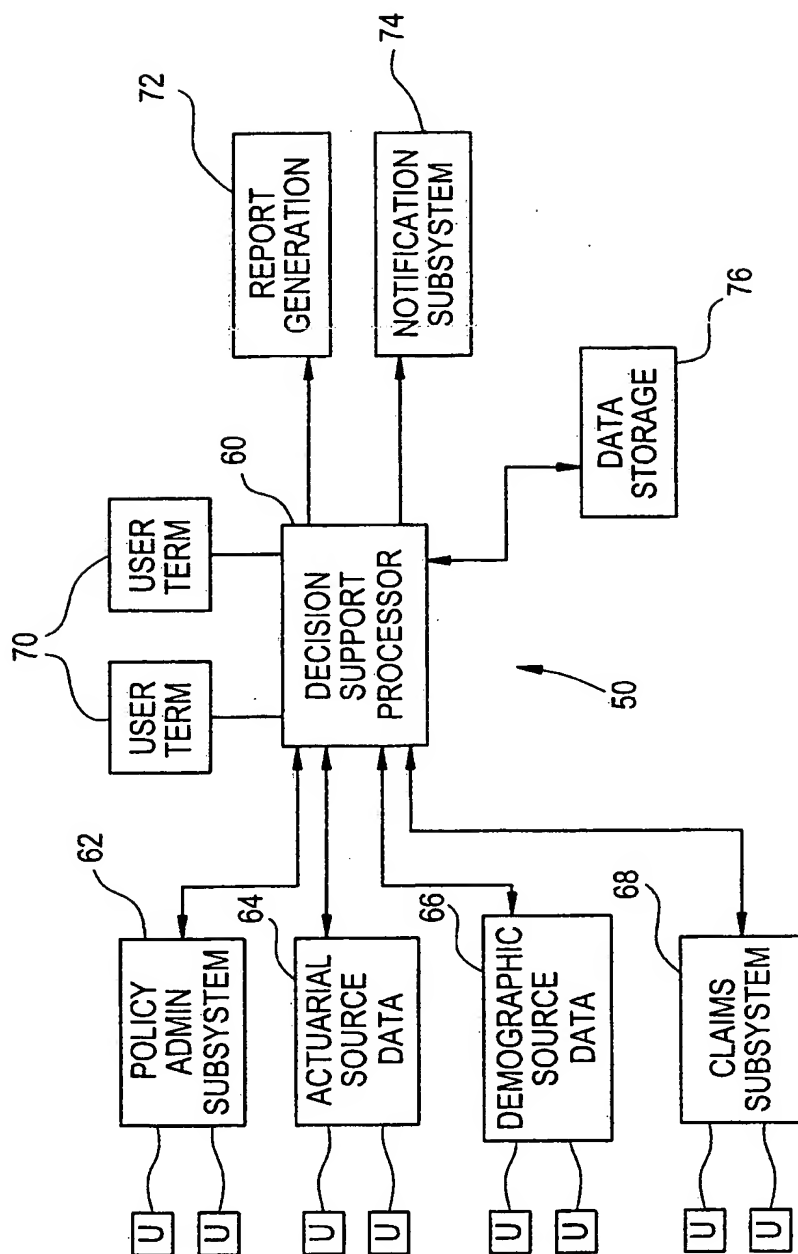
20 3. The method according to claim 1 further comprising the step of smoothing measures following said step of calculating said desired measures.

4. The method according to claim 1 wherein each of said dimensions has associated therewith at least one value or at least one range.



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FIG. 1



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FIG. 2

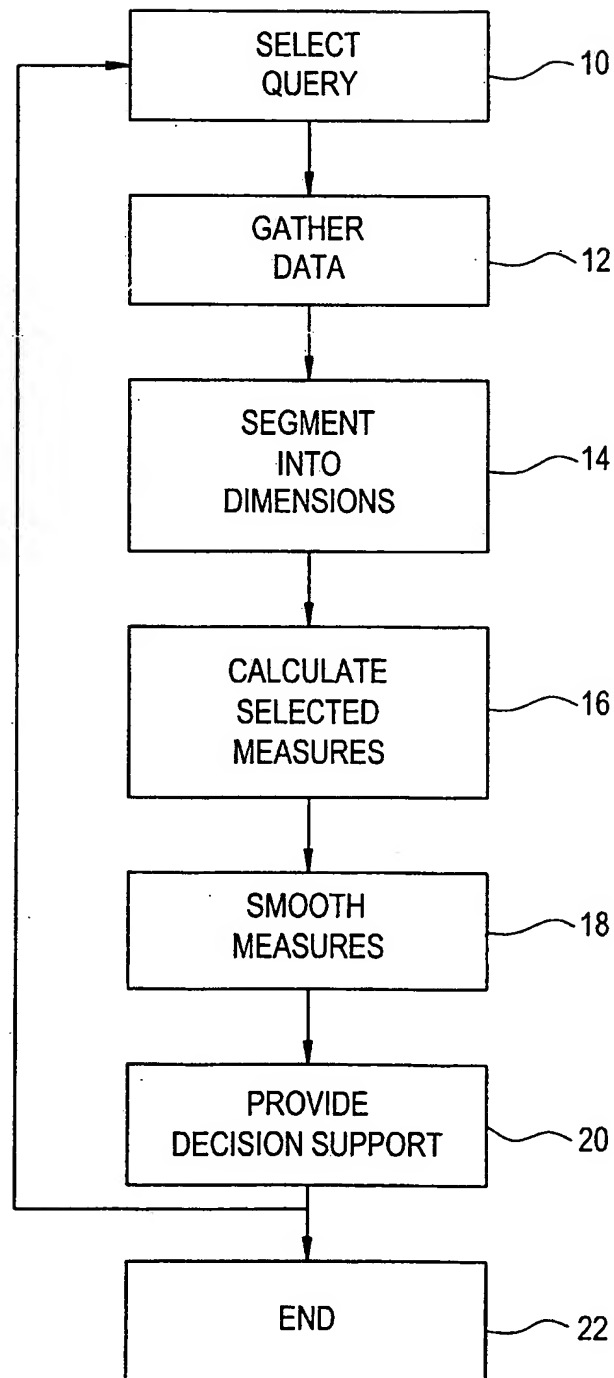


FIG. 3

TOOLBAR

CALCULATION OPTIONS

DIMENSION/VALUE/RANGE SELECTION

ALL STATES

ALL ISSUE AGES

ALL OCCUPATION

ALL GENDERS

A/E CLAIM COST									
	ALL EPS	365	730	1095	1460	1825	2190		
ALL MARITAL	0.96	0.12	0.77	0.67	0.99	0.17	0.91		
M	0.81	0.13	0.57	0.58	0.91	0.00	0.44		
D									
S	1.15	0.09	1.08	0.83	1.06	0.35	0.21		
U	1.22		0.31		1.16		2.36		

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FIG. 4

300

TOOLBAR 302

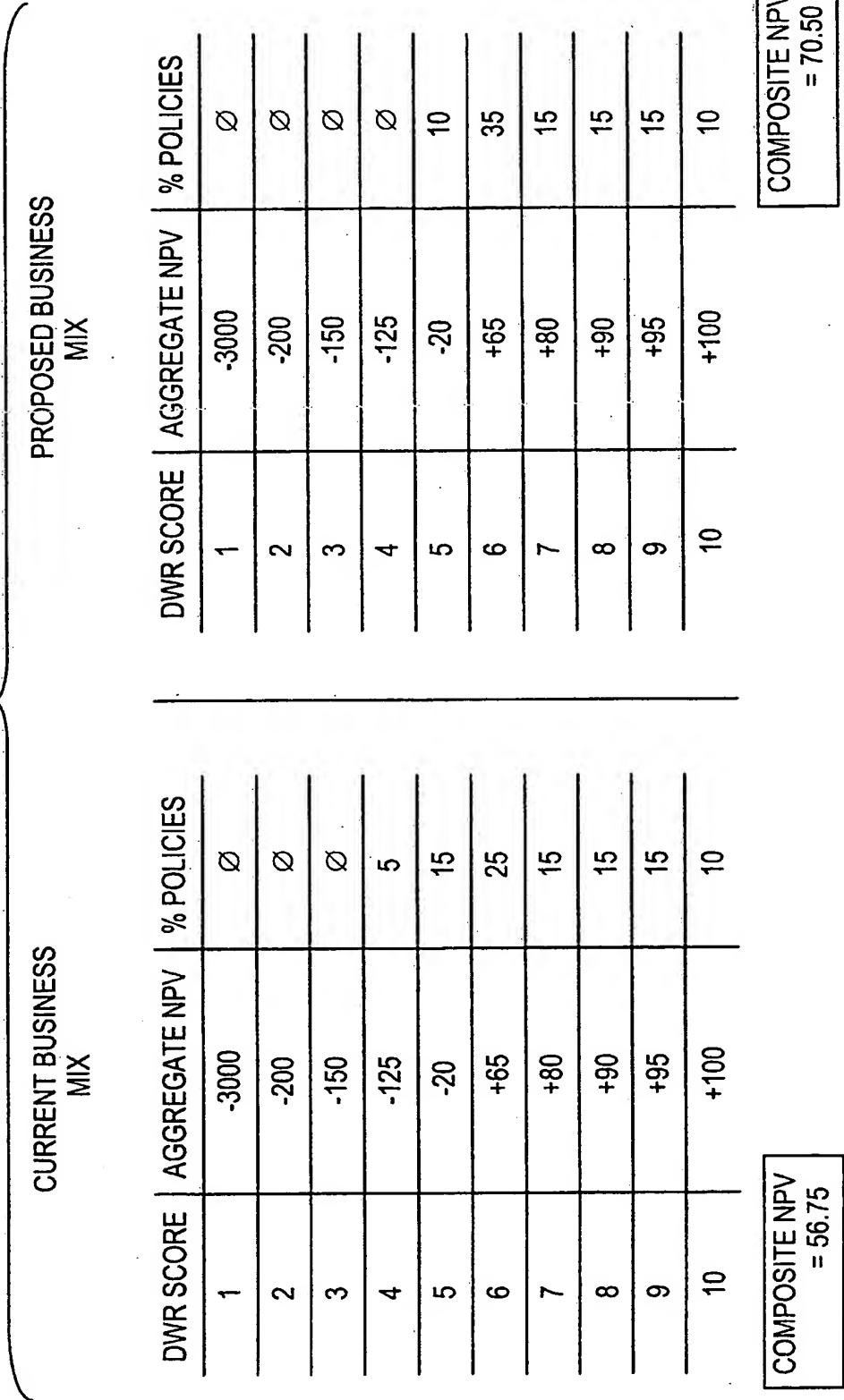
CALCULATION OPTIONS 304

DIMENSION/VALUE/RANGE SELECTION 308

ALL STATES ▼ EMPLOY STAT ▼ ALL EPS ▼ 306

	NPV.	
	M	
ALL OCC.	\$21	
ADMIN	\$16	
FARMER	\$14	
HOUSEWIFE	\$13	
STUDENT	\$30	
RETIRED	\$17	
SELF-EMP/PROF	\$15	
SELF-EMP/OTHER	(\$34)	
SELF-EMP/RET.	(\$12)	
PROFESS	\$17	
OTHER	\$14	

FIG. 5



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(57) Abstract:

# PATENT COOPERATION TREATY

# PCT

## DECLARATION OF NON-ESTABLISHMENT OF INTERNATIONAL SEARCH REPORT

(PCT Article 17(2)(a), Rules 13ter.1(c) and Rule 39)


Applicant's or agent's file reference <b>85FA00103</b>	IMPORTANT DECLARATION	Date of mailing(day/month/year) <b>13/12/2001</b>
International application No. <b>PCT/US 00/ 34033</b>	International filing date(day/month/year) <b>15/12/2000</b>	(Earliest) Priority date(day/month/year) <b>30/12/1999</b>
International Patent Classification (IPC) or both national classification and IPC <b>GO6F17/60</b>		
Applicant <b>GE FINANCIAL ASSURANCE HOLDINGS, INC.</b>		

This International Searching Authority hereby declares, according to Article 17(2)(a), that no international search report will be established on the international application for the reasons indicated below

1. ☒ The subject matter of the international application relates to:
  - a. ☐ scientific theories.
  - b. ☐ mathematical theories
  - c. ☐ plant varieties.
  - d. ☐ animal varieties.
  - e. ☐ essentially biological processes for the production of plants and animals, other than microbiological processes and the products of such processes.
  - f. ☒ schemes, rules or methods of doing business.
  - g. ☐ schemes, rules or methods of performing purely mental acts.
  - h. ☐ schemes, rules or methods of playing games.
  - i. ☐ methods for treatment of the human body by surgery or therapy.
  - j. ☐ methods for treatment of the animal body by surgery or therapy.
  - k. ☐ diagnostic methods practised on the human or animal body.
  - l. ☐ mere presentations of information.
  - m. ☐ computer programs for which this International Searching Authority is not equipped to search prior art.
  
2. ☐ The failure of the following parts of the international application to comply with prescribed requirements prevents a meaningful search from being carried out:
 

☐ the description
☐ the claims
☐ the drawings
  
3. ☐ The failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions prevents a meaningful search from being carried out:
 

☐ the written form has not been furnished or does not comply with the standard.
   
☐ the computer readable form has not been furnished or does not comply with the standard.
  
4. Further comments:

Name and mailing address of the International Searching Authority  European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer  <b>Lucia Van Pinxteren</b>
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## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 203

The claims relate to subject matter for which no search is required according to Rule 39 PCT. Given that the claims are formulated in terms of such subject matter or merely specify commonplace features relating to its technological implementation, the search examiner could not establish any technical problem which might potentially have required an inventive step to overcome. Hence it was not possible to carry out a meaningful search into the state of the art (Art. 17(2)(a)(i) and (ii) PCT; see EPC Guidelines Part B Chapter VIII, 1-6).

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.